Seminars in Biotechnology BTEC 591 & BTEC 691

"Bioprinting of 3-D functional tissue models"

Thursday, October 3, 2019
13:30
MBG Conference Hall

Assistant Professor Dr. Tuğrul Tolga Demirtaş
Erciyes University, Department of Basic Pharmaceutical Sciences Faculty of Pharmacy and Genome and Stem Cell Center (GENKOK)

Dr. Tuğrul Tolga Demirtaş graduated from Pamukkale University, Department of Chemistry with BSc degree. He got his MSc degree in Bioengineering (2007) and PhD degree in Bioengineering from Hacettepe University (2016). He had been in Stanford University at Stanford Medicine ,Canary Cancer Detection Center as a TUBITAK Scholar during his Doctorate education (2014-2015). During his doctorate studies at Stanford University, he developed 3-D functional bio-printed vascularized bone tissue model, 3-D neuron organoid models and 3-D bio-printed functional liver. He has 10 years of experiences in biomaterials, tissue engineering, 3-D cell culture and stem cell differentiation. Since March 2019, he has been working as an Assistant Professor in Erciyes University Department of Basic Pharmaceutical Sciences Faculty of Pharmacy and Genome and Stem Cell Center (GENKOK). He has been working on bio-printing of tissues and organs, personalize therapy for cancer treatment (bio-printed 3-D tumor models) and stem cell differentiation. He has 3 national and international patents about biomaterials.

Abstract

The main purpose of the tissue engineering is to create organs or tissues in laboratory conditions, in the event of damage or loss of vital tissue and / or organs. Two tissue engineering strategies have been identified as '' Top-down'' and ' bottom-up''. '' Top-down'' tissue engineering approach is based on the design and fabrication of tissue scaffolds. Tissue scaffolds can be natural, synthetic or cell-free organs.
''Bottom-up'' approach, is a proffered automatic approach for production, duplication and scaling of tissue engineering products, also based on imitating the local functional units and merging constituents in wide tissues by using layer stacking, random packing and three-dimensional printing. Nowadays featured type of this approach is called 'bio-printer'' Bio-printer defined as robotic dispenser and tissue bio-assembler, and based on usage of the computer assisted transfer processes for designing and combining of 2 or 3 dimensional organized live / non-living materials. By these way biotechnological products, used in regenerative medicine, pharmacology, and basic cell biology studies, can be obtained. Comparing to conventional tissue scaffolds, bioprinter and lithography has many advantages: i) allow 3-D and simultaneous positioning of many cell types, ii) allow tissue creation by high density levels of cells, iii) provide solutions to veining in tissue bolsters; and iv) allow in situ organ printing.

This talk will focus on strategies for creating 3-D bio-printing functional tissues and their usage. The use of bio-inks for bioprinting systems will be discussed. Further, a brief summary of the bio-printing commercial studies performed at the bio-printing companies will be provided.